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SONG AND CALL-NOTES OF ENGLISH SPARROWS WHEN REARED BY CANARIES.¹

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It is well known that song birds can be trained to sing other songs than that of their species. It is held even that song in birds is largely, if not entirely, a matter of imitation. Daines Barrington, on the basis of numerous experiments, says that they seem to prove decisively that birds have no innate ideas of the notes which are supposed to be peculiar to each species. Morgan says that though we may not yet unreservedly accept the view that the song of birds is wholly a matter of imitation, with little or no congenital tendency to sing true to type, yet it is an established fact that imitation is an important factor.

Mr. C. A. Witchell says that it is clear that birds inherit the desire and power to sing, and style of song, and that some definite cries are perpetuated solely by the same agency. He says that it is certain that the call-notes of the fowl, pheasant, turkey, partridge, duck, goose, and "common shelduck" are inherited, that, whether reared naturally or artificially these birds are equally willing and able to employ them upon the appropriate occasions; that those of the pigeon, cuckoo, crow and his allies, hawks and their allies, and others of limited voices, are probably inherited, but may be transmitted by imitation. He thinks that call-notes and danger-cries play an important rôle in the song of birds. He finds that many species have their call-note repeatedly recurring in their song, that many good singers frequently construct whole phrases of a repetition of single cries, and that the goldfinch, the house-sparrow—for undoubtedly the latter occasionally tries to sing, he says—and the linnet appear to construct their song wholly of call-notes and of danger-cries. He says that his evidence shows that the songs were, at first, mere repetitions of call-notes, or possibly of defiance-cries which have since been more rapidly uttered and varied with the result that novel strains have been slowly developed. Darwin's theory that bird-song is a charm or a call-note addressed to the female, he thinks is true during the breeding season, but holds that the first songs of immature birds such as the young skylark, robin and

¹This study was undertaken at the suggestion of Dr. C. F. Hodge, to whom I am under great obligations for much valuable assistance.

thrush, cannot reasonably be considered to be directly occasioned by the emotion of love.

Witchell finds that imitation is very prominent in bird song. Birds in their wild state do not only imitate other birds, but also insects, quadrupeds and sounds produced by the elements. A few of his illustrations will make his point clear: The voices of the owls simulate the moaning of the wind in hollow trees, such as these birds frequent; the *sweet ree* of the common swift is similar to the swish of his wings as he skims through the air; the voices of mallards, pelicans, flamingoes, and herons resemble the croaking of frogs and toads. In British Columbia he heard a wren imitating perfectly the trickling of water. Moreover, many of the warbling birds build their nests not far from water, probably on account of the insect supply, and are thus often within hearing of the intricate music of babbling brooks. He thinks that such birds as the robin, wren, hedge-sparrow, blackbird, and blackcap which sing mellow tones and intervals of pitch rather than imitations of other sounds, may have acquired this music partly through the influence of the murmurs and gurgles of rippling streams. The common call-note of the "brown wren" resembles the chirp of the cricket—this bird is generally found along hedge rows where crickets abound and thus hears the cricket's chirp by day and by night. The song of the "grasshopper-warbler" is exactly like the persistent song of the green field cricket. The cry of the ostrich resembles the roar of the lion, and the shrill note of the red-headed woodpecker that of a species of tree frog which frequents the same trees. In the latter case the resemblance is so great that the cries can hardly be distinguished. The squirrel and the snake reproduce in their alarm-cries the sounds made by these animals during rapid retreat—the squirrel the swish of a long twig, and the snake the rustling of dry grass as she glides through it. He gives very numerous instances of birds imitating other birds.¹

A few years ago Mr. W. E. D. Scott found that Baltimore orioles when left without training sing a song of their own. He reared two young birds of this species so that they did not hear any song or notes to imitate. Two years later he secured three other young orioles about six days old and placed them with the older ones. His conclusion is that "two birds *isolated from their own kind and from all birds*, but with a strong inherited tendency to sing, originated a novel method of song, and that four birds, *isolated from wild representatives of their own kind and associated with these two who had invented the new song*, learned it from them and never sang in any other way."

¹ Cf. Evolution of Bird Song.

The call notes of these birds was similar to that of the wild species.¹

During a period of six or seven years he took many birds from their nests when very young, reared them by hand until they could take care of themselves, and then liberated them in large rooms in order to give them as much freedom as confinement would allow. In this way he tried to observe what birds would do if left to themselves and supplied with food and water. No effort was made, however, to keep these birds from hearing the song of wild birds out of doors. The following species were secured : 12 bluebirds, 14 robins, 6 woodthrushes, 7 catbirds, 2 thrashers, 2 yellow-breasted chats, 2 rose-breasted grosbeaks, 1 cardinal, 6 Baltimore orioles, 7 orchard orioles, 1 bobolink, 2 cowbirds, 4 crow-blackbirds, 5 red-winged blackbirds, 1 meadow lark, 6 bluejays. None of these birds had normal songs.²

In 1903 Scott reared a brood of bobolinks and two broods of red-winged blackbirds; the former were secured when about four days old and the latter when about a week old. There were two males in each species. The song of these four birds was such that competent judges did not recognize it as the song of the species. The two bobolinks had no note that resembles the call-note nor any sound that resembles the song of the wild species; the two red-winged blackbirds, however, had the call-note of their species. He also reared, in the same year, two male grosbeaks from their fourth day on. The tone of their song, he says, has the soft plaintive quality characteristic of the rose-breasted grosbeak, but the method is not that of the wild species.³

The call-note of birds seems to be, as a rule, more clearly subject to inheritance than song, being biologically much older. Witchell has found in this connection that the cries of the young of birds physically allied are more alike than the cries or songs of adults of the same species. He thinks that the original cries of the various kinds of birds are recorded in their danger-cries and call-notes, and that the notes of later developed cries and modes of singing are indicated in the first parts of songs because these have the most generic characters. As to the question of imitation in call-notes one can but agree with Witchell who says until extensive experiments have been made we shall not be able to determine the extent to which imitation generally affects the call-notes of the young. Furthermore, in experiments on this subject all contact with the parents must be avoided, since the note of the parent may have an effect on the bird

¹ *Science*, 1901, Vol. XIV.

² *Science*, 1902, Vol. XV.

³ *Science*, 1904, Vol. XIX.

even before it is hatched. Scott thinks that it is improbable that during the first few days of their lives birds acquire much appreciation of the song of the male parent though he is constantly singing close at hand. That the notes of the parents, however, affect the young even before hatching is shown by the observations of W. H. Hudson who has observed several different species on this point. He says: "When the little prisoner is hammering at its shell, and uttering its feeble *peep*, as if begging to be let out, if the warning note is uttered, even at a considerable distance, the strokes and complaining instantly cease, and the chick will then remain quiescent in the shell for a long time, or until the parent, by a changed note, conveys to it an intimation that the danger is over."¹

Though the last part of this statement does not seem to rest on a rigorously scientific basis, and the first part is not checked by experiment as to whether the unhatched bird would react to other noises than alarm-cries, yet the observation seems to show that the voice of the parent bird affects the young even before hatching.

Experiments indicating to what extent a bird that has no native song can be taught the song of another species, and to what extent the call-notes of one species may be imitated by another are few. With this question in mind the writer attempted to raise English sparrows in the nest of canaries. The English sparrow was selected not only because it is an unmusical bird, but also because it is a bird of unusual independence.

The earliest scientific record of an experiment to teach the English sparrow to sing is that by Daines Barrington as early as 1773. He says: "I took a common sparrow from the nest when it was fledged and educated him under a linnet; the bird, however, by accident heard a goldfinch also, and his song was, therefore, a mixture of the linnet and goldfinch," and adds, "though the scholar imitated the passages of its master, yet the tone of the sparrow had by no means the mellowness of the original. . . . The imitation might therefore be, in some measure, compared to the singing of an opera song by a black-guard."

Witchell says: "The male wild sparrow, when perched comfortably in sunshine, often rehearses his vocabulary in a way which indicates attempts at song. If reared under birds of another species in a cage, the sparrow has their notes, and not sparrow notes, though he retains the sparrow tone of voice, and he may then become quite a pleasing singer." He gives no concrete examples, however, and adds that though he has listened for years for a sign of mimicry, he has heard only one

¹ The Naturalist in La Plata, p. 90.

sparrow imitate, and that one reproduced the alarm-cry of the starling. His brother, E. N. Witchell, he says, has heard a sparrow imitating the alarm-cry of the blackbird and the whistle of the chaffinch. He says he has often heard the male sparrow give what seems to be a song note as follows: "teeoo-woh." He thinks it indicates contentment. It might be added here that it is a matter of common observation that the sparrow gives a succession of notes which can be interpreted as a crude attempt at song.

Sterland also reports the case of a sparrow that learned the song of the skylark. We here and there find other statements to the effect that the English sparrow will imitate the song of other birds, but they are not supported by new evidence and are probably based on the experiments above quoted. (Sterland's report I take from Witchell, *Evolution of Bird Song*.)

The plan of our experiment was to have the canary hatch the sparrow-eggs and rear the birds without hearing a sparrow note, so that every impression whatever that the parent sparrow's note might have on the young, even during the first moments of life, might be ruled out. The experiment was begun July 1, 1903. During the summer of 1903, however, little was accomplished since the canaries did not nest, the molting season being at hand, and when they nested in the fall the sparrows had stopped laying. One canary hatched a brood of sparrows but they all died from lack of care from their canary mother. The cause of this neglect is probably difficult to explain; it may be that the eggs hatched too soon since the sparrows had already brooded them to within $3\frac{1}{2}$ days of hatching, or it may be that the female canary was discouraged because the male had been removed—the following year another female canary from whom the male had been separated neglected its brood of young sparrows. The next year, 1904, the experiment was continued as soon as the sparrows began to lay, which was about the middle of April, but without success. Nine attempts were made, but all failed. In one case the canary neglected her young; in three cases the canary deserted her nest, possibly because the time of hatching was somewhat extended due to the change of eggs from canary to sparrow; in two cases the canaries failed to nest and in two cases the females took sick. In one case the brood of four sparrows was duly hatched and well cared for by the parents, but on the 10th day the female canary went into the nest and with seeming malice stamped them to death. She was caught in the act but too late to save any of the young. I cannot give a satisfactory explanation of this vicious act. It is true, the sparrow at this age is more naked, and, to our sense of beauty, more ugly than the young canary, yet it is too much to suppose that the canary has the

same esthetic sense. However, it is possible that the canary's instincts were done violence in some way, since another sparrow, mentioned later in this paper, raised in a canary's nest grew up seriously crippled.

Another part of the experiment carried on at the same time was more successful. When my first and only brood of sparrows in 1903 were dying, I procured, on July 15, four other young sparrows about one day old and placed them in the canary nest just as the last one of the original brood was passing away. Of these four all but one died. This bird after he had been placed in the canary's nest heard no other sparrow chirp but his own. He grew up seemingly well. But when he was old enough to leave the nest I found that he had both feet crippled, that his tail came out sideways and that his wings were deficient. What happened to him is not known; it may be he received vicious treatment similar to that administered to the other brood mentioned above.

In due time this bird developed his sparrow chirp when calling for food, though he heard no sparrow note and was in a room with about twenty or more canaries, some of which were young and were just beginning to sing. By and by he gave this chirp less and less, using a fine peep instead—a peep similar to the peep of the young canaries. During September the sparrow chirp was rare and when it was given it lacked the harshness of that of the wild sparrow, but had a quality rather similar to that of the whistle of the quail. After Oct. 20, I observed the bird daily, but before that time I observed him only two or three times a week, long enough to hear him go through a characteristic chirping spell.¹ The bird was now observed daily not only by myself but also by my wife whose opportunities for observation were better than mine. He showed no tendency to imitate song till Oct. 29th, when he suddenly chimed in with the canaries in his own fashion, giving a low note followed by a few high notes with now and then some slurs from a high to a low note similar to the notes the canaries have in their overtures. He joined the canaries freely for a few days when he became ill and was silent for a few weeks. About the middle of November he again joined the canaries violently, but it was such a confusion of notes that I was not able to record them. In general outline his effort resembled the confusion of notes which occurred when all three of my canaries were singing their best. This violent, confused song which consists of a rapid repetition of single notes and which

¹Up to this time the bird was kept with the canaries of Mrs. and Miss Harrington, 8 Norwood Street, Worcester, for whose kind assistance in this matter I wish to acknowledge my indebtedness.

was not very musical but rather harsh (the loudest of my canaries also has a harsh voice), he kept up till he was taken away from the canaries about May 1st, 1904. He kept up this song for some weeks after his removal, but by the middle of July had lost it completely. The causes are discussed in a later part of the paper.

About July 3, 1903, I got two sparrows probably about two weeks old. A few days later I got four little fledglings. I fed them by hand with rolled cracker and hard boiled egg mixed, to which I later added small bird seed. I placed them all near my canaries for instruction. The instruction, however, was very meagre, since before September only one of the male canaries sang occasionally and one female gave an occasional solitary, unmusical trill. Between Aug. 15-25th there was absolutely no canary song at all, but the canary call notes were given though not as freely as usual. After September 2 the canaries gradually began to sing again. Thus we see that the sparrows' instruction was extremely moderate during the first two months and rather inadequate during the third month of their life. That is, during probably the most impressionable age of the birds' life the instruction was most seriously insufficient.

Since it is often hard to accustom wild birds to cage life a few words as to feeding may not be out of order. During the latter part of August the sparrows showed signs of being sick, probably because I tried to feed them chiefly with cracked grain. I now again gave them a variety of seeds and kept fresh sand in the cage as before; I gave them again egg and cracker as I had done when they were young, but I noticed no improvement till I gave them fish bone. This they ate greedily for a while, and one of this group got well, the others all died. The two birds that I still have I am feeding with a variety of small bird seeds, also cracked sunflower seed, hempseed and grain, whole wheat bread, crackers (without salt), fishbone, greens—daily in summer, and now and then rolled cracker mixed with grated hard boiled egg. They eat very little, if any, grain, and my experience leads me to believe that seeds and special bone material are indispensable for these birds. They have been perfectly healthy since their first sick spell.

All the sparrows of this second group had their sparrow chirp well developed when I got them, and the one that remained alive is the only one of this group that ever attempted to imitate the canaries; he always showed more vitality than the others. During the first part of August, when the canary sang, he would sometimes give notes that were different from the regular sparrow chirp; they were less forcible, lower and hoarser. Even when he uttered no sounds throat movements

were often noticed when the canary was singing. Toward the latter part of the month these notes became louder so that they could be heard distinctly in an adjoining room. They always were given only when the canary sang though the sparrow chirp was given freely at any time. He now began to give notes in rapid succession running up the scale from three to five notes and then giving five to six of the higher notes all in one run. He gave three or four such runs in rapid succession, each containing about from eight to twelve notes. In the latter part of September he was observed to run up and down and up the scale all in one run.

At first his voice was not beautiful; it was hoarse. It sounded somewhat like the voice of some female canaries when they try to sing. Some notes remind one of the human voice when one recovers from a cold. He sang on a lower scale; he often tried to reach higher notes but did not succeed. Later his voice became softer and milder and approached in quality the voice of the canary.

On September 26, when the sparrow was a little over three months old, he was for the first time observed to give a trill. It was short and musical and was given a number of times in succession. These short trills were at first only rare but they increased in frequency during the year. When he gave them he would sit still on his perch and give them one after another very modestly. Now (Dec., 1904) he gives short trills interspersed with other notes, punctuating the whole by turning complete circles and semi-circles on his perch.

None of these sparrows ever had the characteristic call-notes of the wild species, but by and by adopted those of the canary. They imitated the canary perfectly except that their voice did not have the musical finish. The bird that was two weeks old when I got him gave the *shikikik* alarm-cry occasionally at first, but later lost it altogether.

About May 1, 1904, I took both sparrows to a room in the university away from the canaries. For the first few weeks they maintained themselves very well in their new quarters. They were here, however, not only deprived of the instruction and the stimulus which the canaries gave them, but they were literally flooded with sparrow notes from the outside, so that by the middle of July they had not only lost their song, but had readopted a considerable part of the sparrow chirp. Their voice remained more musical than that of the sparrow, but the pitch and general flow of the chirp resembled that of the wild sparrow. About the middle of September I placed the canaries and the sparrows together again and in a few weeks they regained completely what they had lost.

Here we have, then, two young sparrows which in about nine

months not only imitated some of the song of the canary but also adopted the canary's call-note, and which upon removal from the canaries and again hearing sparrow notes very freely, rather rapidly dropped back into the ways of the sparrow, but upon renewed instruction rapidly regained all they had lost.

It is intended to continue this experiment by hatching and rearing sparrows in the nest of the canary, and, if possible, to raise sparrows by hatching the eggs in an incubator and rearing them by hand without allowing them to hear a sparrow or any other bird note. Raising a bird by another species and having it imitate the notes of that species can demonstrate the power of education; if a bird can be reared without hearing any bird notes whatever more light may be obtained on the question of instinct.

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